doubtful phenomena of the inheritance of the effects of use and disuse and of other acquired modifications of the individual by external conditions, which Darwin accepted as a fact, though he remarked upon it: "Nothing in the whole circuit of physiology is more wonderful."

Every one who reads this account of Pangenesis will feel admiration for its ingenuity, and surprise at the completeness with which it can be made to explain all the varied phenomena of inheritance, though some of these explanations seem more verbal than real. Readers will also understand the fundamental difference between this theory and that of Weismann; and will see, that in order to decide which best explains the whole series of phenomena, the inheritance or non-inheritance of acquired characters, as a matter of fact, must first be settled.

The difficulty of conceiving the actual operation of the theory of Pangenesis may be best illustrated by an example. Taking a bird, such as a peacock, the theory implies that not only every cell and fibre of bone, muscle, skin, and all internal organs gives off gemmules which all find their way into every one of the cells constituting the sperm or reproductive fluid, but that every one of the feathers also sends gemmules from each of the cells that build up its wonderfully complex structure, not only in the adult stage, but in the condition they assume in the young and adolescent birds; and further, that every detail of varying colour of the barbs of these feathers send off their gemmules, and that all this inconceivable number of gemmules must travel through the whole structure of the quill, and through all the tissues of the body, till they reach the reproductive organs, and every one of these gemmules must reach all or most of the sperm-cells, failing which there would be a corresponding deficiency in the offspring. But as important deficiencies of feathers, or of colour on the various feathers, which produce the beautiful patterns and ornaments of a bird's plumage only rarely occur, we must assume that the passage of the millions of gemmules from the ends of the feathers of a peacock's train through the whole length of the shaft, and then to the sperm-cells, is almost always successfully accomplished. In addition to the enormous difficulty, on any theory, of conceiving the processes of growth and development of the complex parts of living organisms, we have, on this theory, an equal or greater difficulty in the reverse process, by which the gemmules from every cell get back again to the sperm and germ cells. Without asserting that this process is impossible or inconceivable, it is well to endeavour to realise what it really is and its almost incredible complexity.

Prof. Poulton gives a brief account of the experiments made by Mr. Galton and the late Mr. Romanes to test the theory of Pangenesis, by the transfusion of blood and the transplantation of skin, from one variety of animal to another, and then breeding from the modified individuals; but in no case was any effect produced on the characters of the offspring. Though, perhaps, not quite conclusive, these experiments indicate that there is no such continuous transference of gemmules as the theory requires.

The remaining three chapters deal with the descent of man and sexual selection, the various botanical works, and a series of hitherto unpublished letters to Prof. Meldola, chiefly interesting as illustrating Darwin's kindness to all students of natural history, and the amount of trouble he took to be of use to them.

On the whole, Prof. Poulton is to be congratulated on the production of so interesting a book, which in a wonderfully limited space gives a connected account of Darwin's life and work, and especially of some portions of his theories which have been almost neglected by other writers. A good print, from a photograph, of Darwin's statue in the Natural History Museum, forms the frontispiece of the volume.

ALFRED R. WALLACE.

LIFE OF BRIAN HOUGHTON HODGSON.

Life of Brian Houghton Hodgson, British Resident at the Court of Nepal. By Sir William Wilson Hunter, K.C.S.I., M.A., LL.D. Pp. 389, 8vo. (London: John Murray, 1896.)

IN this charming volume Sir William Hunter has compiled a worthy memorial of one of the most famous of our Indian civilians, one of the very few who have been able to rise above the details of their daily work, and to take a real intellectual interest in the history or the science of the strange people and lands in which their life is cast.

Born in 1800, young Hodgson, who had influential relatives, was in 1816 offered a nomination to the East India Company's service, and entered Haileybury College, where all the civilians were then trained. Malthus was then Professor of Political Economy in the college, and happened to be an old college friend of an intimate friend of the Hodgsons. Advantage was taken of this to introduce the new scholar, and Malthus not only made him his guest during the first session, but remained throughout the lad's college residence his constant friend. Henry Walter had also just joined the college as Professor of Chemistry and Natural History, and Sir James Mackintosh became Professor of Law two years afterwards. No doubt the future scholar and collector owed very much to the teaching of Malthus and Walter, and to the personal friendship of the former; though the traces of their influence on any other of the collegians of the time are not conspicuous.

In December 1817 Hodgson passed out of Haileybury as gold medallist and head of his term, and sailed in the following year, round the Cape, to Calcutta. Sir Charles D'Oyly, the Controller of Customs, a connection of Hodgson's family, and a man of much artistic and literary culture, welcomed him, and made his house his home. Not only were the D'Oylys leaders in Calcutta society, but Sir Charles had only lately brought out a book on the antiquities of Dacca. And it was through the influence of Lady D'Oyly, a near connection of the Governor General's, that young Hodgson was shortly appointed assistant to the Commissioner of Kumaun—one of those appointments in the hills, then very few in number, reckoned among the prizes of the Service.

Kumaun had only just been taken from Nepal by the English; and the duties of the new Assistant consisted chiefly in helping to make a revenue settlement in the new province. The fine air of those lofty valleys soon restored his health, which had seriously suffered in Calcutta. Both his duties and his sport brought him into close contact with the people. But he was not to remain there long. In 1820 the Assistant-Resident at the Court of Nepal died, and Hodgson succeeded to the post. Two years afterwards he returned for a short time to the Secretariat in Calcutta, but in 1825 he was reappointed to the Assistant-Residentship in Kathmandu. In 1833 he became the Resident, and remained in that appointment until he left the Service in 1843.

The daily duties of such a Resident at an independent Court are, in quiet times, not onerous. But now and again, when in the never-ceasing struggles of palace intrigue the anti-English feeling, naturally always existing, comes to the front, the position of Resident becomes suddenly of importance; his work becomes all-absorbing, and constant demands are made upon his judgment, his tact, and even occasionally upon his personal bravery. Sir William Hunter is an excellent guide through the intricacies of the palace cabals, and sets out the dismal story of the deposition, exile, or murder of successive nominal rulers, and of the rise to power of the real rulers, the mayors of the palace, three out of four of whom came also to a violent end. Throughout these crises it was acknowledged on all hands (with one exception) that Hodgson conducted the necessary negotiations with wisdom, tact, and courage beyond praise. But that exception was the Governor General. When he was convinced, at last, that the Resident was acting less on the orders given than on his own view of the position, Lord Ellenborough dismissed him from his post, and offered him a minor appointment in Simla This the sensitive spirit of Mr. Hodgson could not brook, and he resigned the Service in 1843.

During his long service at Kathmandu the Resident had never lost an opportunity of adding to his wide knowledge of the history of the zoology of Nepal and Tibet. And when he was thus forced out of the Service, his name was already known and honoured throughout the world. Nepal had been for centuries an asylum for the Buddhism which had died out in its original home in the valley of the Ganges. There and there alone are to be found those Sanskrit Buddhist MSS. on which the Buddhism, not only of Nepal itself, but of Tibet and China, of Japan and the Korea, is based. No less than 423 of these otherwise inaccessible records of the Buddhist movement were either bought or copied by Hodgson, not for himself, but in order that, with a generosity as unequalled as was his intellectual ardour, they might be presented either to the Asiatic Society in Calcutta, or to similar learned bodies in England and France. So far as it was possible for one, not himself a Sanskrit scholar, to discuss or elucidate the problems of the history of the ancient faith of Buddhism, he endeavoured to do so, and spared neither trouble nor expense in gathering from the *pandits* of the Nepal capital such knowledge as they possessed. This he communicated, from his solitary outpost in the hills, to the Asiatic Society of Bengal; and these results of his researches in what was then an almost unworked field aroused the enthusiastic appreciation of scholars throughout the world. He had hoped that the MSS. he presented would enable Sanskrit scholars to carry on, from the original sources, the researches he had thus begun from the mouths of living witnesses. In only one instance were his hopes realised. The MSS. he sent to Paris lured Eugène Burnouf from his other pursuits, and led him to devote his genius and scholarship to those studies in early Buddhism which really laid the foundation of all we now know on the subject. (His first great work on Buddhism is dedicated to Hodgson.) Nearly half a century elapsed before even a catalogue appeared of the Hodgson MSS. in Calcutta, and that is an inaccurate and unsatisfactory work. The much better catalogue, entirely trustworthy, so far as it goes, of the Hodgson MSS. in the Royal Asiatic Society, had appeared a few years before. But no English scholar had worked at them. It is only in the last few years that they are beginning to be a little utilised, to be appreciated at their right value. Foreign scholars have devoted themselves to the work; and notably M. Senart in Paris has taken up, in a masterly manner, the work left unfinished by the premature death of Burnouf. So year after year the gratitude of historical students will go out in increasing measure to the enlightened generosity of the scholar who has provided for their use the largest body of original documents on Buddhism which, up to his time, had ever been gathered together either in Asia or in Europe—documents whose very existence had been previously unknown.

When he left the service, Hodgson, after a short stay in England, settled in Darjiling, and began then to take up seriously a quite different branch of historical inquiry in which he had also been always interested. This was the very complicated question of the non-Aryan races of the Himalayan valleys. He contributed numerous papers on the language, religion, customs, and social condition of these tribes to the Asiatic Society of Bengal. His work in this field of inquiry was not only that of a bold pioneer, who laid down with admirable judgment the right method of inquiry, but has also remained in most instances till to-day the best that has been done, and, with regard to almost all the tribes with which he dealt, it is the foundation of all subsequent work. As year by year the importance of the non-Aryan element in all questions relating, not only to the physique, but also to the history of the religious and social ideas of the Indian peoples, becomes more and more recognised, the value also of this branch of Hodgson's researches has been more and more appreciated. It was fully acknowledged at the time by those most competent to judge, and he was elected an Honorary Fellow of the Ethnological Society—a distinction then shared, amongst Englishmen, only by Darwin, Layard, and Rawlinson.

Meanwhile, during the whole time of his residence in India, Hodgson never lost his interest in what was then called natural history. He wrote no less than eighty papers for scientific societies (mostly for the Bengal Asiatic Society) on the Himalayan mammals, and contributed more than any one else, except only Blyth and Jerdon, to our knowledge of the birds of India. Though his opportunities were confined to two of the smaller districts, he added fully a hundred good new species to the Avi-fauna of British India. "He trained Indian artists," says Hume (whose joint work with Marshall on the "Game Birds of India" is dedicated to Hodgson), "to paint birds with extreme accuracy from a scientific point of view; and under his careful supervision admirable large scale pictures were produced, not only of all these new species, but also of several hundred others, and in many cases of their nests and eggs also. These were continually accompanied by exact, life-size, pencil drawings of the bills, nasal orifices, legs, feet, and claws (the scutellation of the torso and toes being reproduced with photographic accuracy and minuteness), and of the arrangement of the feathers in crest, wing, and tails." Unrivalled as a collector, Hodgson's generosity with his specimens and drawings was equally unrivalled, and practically the whole of them were given to public libraries or scientific societies.

We would not have the appreciation which his biographer has lavished upon his many-sided intellectual activity diminished by a single word. It is only strange that the marked absence of anything of the kind in other civilians should not have seemed to Sir William Hunter to call for any limitation of that exuberant optimism with which he regards the ways and works of every official (except Lord Ellenborough) that he has to mention. No doubt the results of the system of Indian government have been, from a material point of view, encouraging. The members of the Service have developed administrative qualities of a high order. But is there nothing at all that is lacking? Is not intellectual alertness sometimes smothered under a mass of detail, and any really scholarly or scientific knowledge tabooed or discouraged as waste of time? And is not the best executive ability apt to strike cold when it wants the charm of intellectual sympathy? Nothing is more evident in this book than the way in which Brian Houghton Hodgson's wide knowledge and intellectual sympathy helped him in his official work, unless indeed it be the degree in which, in those qualities, he stood alone. We need not wonder that he received from the Indian Government none of those titular honours that were bestowed on many of his contemporaries, now forgotten.

The biography is delightfully and lucidly written, and enriched by contributions from specialists in the various subjects dealt with in Hodgson's works. The charm of the narrative is such that the reader will probably find it only too short. And a word of acknowledgment must be given to the beauty of the illustrations, especially of the striking picture taken by Mrs. Hodgson, to whom the work is dedicated.

OUR BOOK SHELF.

Manual of Determinative Mineralogy, with an Introduction on Blowpipe Analysis. By G. J. Brush. Revised and enlarged by S. L. Penfield. Pp. vi + 208. (New York: Wiley. London: Chapman and Hall, Ltd., 1896.)

THE manual of the veteran mineralogist, and present Director of the Sheffield Scientific School at New Haven, has been in constant use since 1874, and has passed through thirteen editions. The present volume is the beginning of a new and revised edition which has been undertaken by Prof. Penfield. The determinative tables, originally based upon von Kobell's "Tafeln zur Bestimmung der Mineralien," remain as they were in the thirteenth edition, but they are now preceded by four chapters on the qualitative analysis of minerals, which have been in great part re-written by Prof. Penfield. These chapters are, as might be expected from this able mineralogist, entirely excellent. The description of the apparatus and methods employed is most simple and clear, and is rendered attractive by numerous good illustrations, which are in large part new.

The book abounds in practical hints of the greatest value to a beginner. The course consists of a series of simple experiments so arranged as to illustrate the reactions of the various elements, and many of these are designed to illustrate the *difficulties* which attend their use, and the risk of drawing erroneous conclusions, *e.g.* "The mistake is sometimes made of testing carbonates with acids which are too concentrated, as illustrated by the following experiment," &c.; or again, "In order to show that there is sometimes danger of overlooking a small quantity of a carbonate, test as follows."

The rarer elements are treated, as well as those which the student is more likely to encounter, and due regard is paid to newly-discovered reactions. Thus mention is made of the method of testing recommended by Haamel, in which the material is heated in the oxidising flame after being moistened with hydriodic acid, or tincture of iodine, as suggested by Wheeler and Luedeking; and it is recommended that a plaster of Paris tablet should be used to collect the coloured sublimates produced. It is perhaps unfortunate that this method does not find a place in the summary of blowpipe and chemical reactions, which constitutes Chapter iv.

The fundamental principles of qualitative analysis (*e.g.* the nature of the flame, and the action of charcoal) are more fully explained than in the preceding editions; and for these and other reasons, the volume is a more satisfactory handbook for an elementary student than any with which we are acquainted.

The new edition is to be completed by the revision of the determinative tables, and Prof. Penfield promises to add to these a chapter on crystallography and the physical properties of minerals. It is, we think, to be regretted that the publishers have brought out the new edition in an incomplete state.

Grundriss der Entwicklungsgeschichte des Menschen und der Säugethiere. By Dr. Oscar Schultze. Erste Hälfte. Pp. 177. (Leipzig: Engelmann, 1896.)

THIS work, which is a revision of Prof. Koelliker's book, is intended especially for students and practitioners. Although Dr. Schultze writes his descriptions of the various developmental processes in a concise manner, avoiding controverted and purely theoretical points as far as possible, still he has introduced into his book all the more recent important observations on mammalian embryology. The work appears to be throughout in all points quite up to date. The well-chosen figures, which are numerous and nicely reproduced, are all taken from mammalian embryos, and it will doubtless be a satisfaction to a student of human embryology to find such illustrations instead of the oft-repeated figures of fowl, reptile, and even invertebrate embryos common in textbooks on human development. Our present knowledge of the early stages of mammalian embryos quite justifies the omission of such figures in an account of mammalian development. Dr. Schultze has succeeded in making his history of the embryology of man and mammals hang well together. As the work is sure to be extensively used, it is to be hoped that an English translation will shortly be forthcoming. The second part is promised at the end of this year.